PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

51048-2 DIV

In re application of:
Goela et al. :

Serial No.: 09/870,242 :

Filed: May 30, 2001 : Group Art Unit: 1772

For: IMPROVED IMAGING COMPOSITIONS AND METHODS : Examiner: Walter Augenbaugh

DECLARATION UNDER 37 CFR §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Dr. Jitendra S. Goela declares and says:

1) THAT he is a co-inventor of the above-identified patent application and is familiar with the present Office Action mailed April 20, 2005 as well as the previous Office Actions of the above-identified patent application and the applied documents U.S. 5,783,255 to Suda et al. and U.S. 5,776,391 to Sibley;
2) THAT he has been employed at Rohm and Haas Advanced Materials (formerly Morton Advanced Materials) for twenty-one (21) years and currently holds the position of Principle Scientist where he is managing several research and development programs in the area of infrared optical materials such as zinc selenide and zinc sulfide and ceramic materials such as silicon carbide;
3) THAT his work at Rohm and Haas Advanced Materials has involved work with silicon carbide involving the development of new chemical vapor deposited silicon carbide materials such as controlled resistivity silicon carbide, transparent silicon carbide, near-net shape silicon carbide and silicon carbide-silicon carbide bonding as well as

size scaling and commercialization of chemical vapor deposited silicon carbide technology for optics, semiconductor and wear applications;

4) THAT prior to joining Rohm and Haas Advanced Materials he was Assistant Professor for 4 years during 1980-84 and Lecturer for 2 years during 1978-1980 in the Department of Mechanical Engineering at I.I.T. Kanpur, India.

5) THAT prior to working at I.I.T. Kanpur, India, he worked at Physical Sciences Inc. in Andover, Massachusetts for 2 years during 1976-1978 as Principal Scientist where he conducted research and development in the areas of high power lasers and wind conversion;

6) THAT he received his Ph.D. in Engineering in fluids and thermodynamics from Brown University, Rhode Island in 1976 and a M.Sc. in Engineering in fluids and thermodynamics also from Brown University in 1974;

7) THAT increasing the size of ceramic materials such as chemical vapor deposited silicon carbide during synthesis is not generally recognized as being within the level of ordinary skill in the art especially when the volume of the chemical vapor deposited silicon carbide increases by a factor of 2 or more because as the size of the chemical vapor deposited silicon carbide article increases the strength of the article decreases and stresses increase;

8) THAT the chemical vapor deposited silicon carbide is a brittle material susceptible to flaw induced fracture and the strength depends upon the size of the surface flaws and follows the Weibull distribution as defined in Exhibit A;

9) THAT the larger the flaw size the lower is the strength of the chemical vapor deposited silicon carbide article and as the size of the chemical vapor deposited silicon carbide article increases the probability of forming flaws of increasing size also increases, thus the flexural strength (defined as the strength of a material in bending, expressed as the stress on the outermost surface of a bent test specimen, at the instant of failure) of the article decreases;

10) THAT in addition to the strength of the chemical vapor deposited silicon carbide article decreasing as the size of the article increases, stresses in the article increase;

11) THAT there are two dominant stress factors which occur during chemical vapor deposition of silicon carbide: a) growth stresses and b) stresses due to thermal expansion (CTE = coefficient of thermal expansion) mismatch between the chemical vapor deposited silicon carbide and the material composing the substrate on which the silicon carbide is deposited;

12) THAT the growth stresses and the stresses due to thermal expansion mismatch are a function of the size of the silicon carbide article, particularly the deposition thickness;

13) THAT as the size of the silicon carbide deposit increases, the deposition area increases and the variation in deposit thickness increases, thus both the growth stresses and the stresses due to thermal expansion mismatch increase;

14) THAT the method disclosed in Suda et al. may have tried to produce a substrate material that has CTE close to that of the Silicon Carbide. However, it is highly unlikely that the CTE of the substrate material matches at all temperatures during SiC cooldown from deposition temperature due to its large temperature range (1400C to room temperature). Thus although the stresses from CTE mismatch are reduced, growth stresses are still present during chemical vapor deposition of silicon carbide;

15) THAT the chemical vapor deposited silicon carbide article of the presently claimed invention has a diameter of 18 inches or greater;

16) THAT Suda et al. disclose a chemical vapor deposited dome having a diameter of 50mm = 2 inches;

17) THAT an area scaling from a diameter of 2 inches to 18 inches of a chemical vapor deposited silicon carbide article results in a strength decrease by a factor of about 3 as determined by the following equation for determining the strength of a chemical vapor deposited silicon carbide article as disclosed in Exhibit B:

$$\sigma_2 = \sigma_{18} (A_{18}/A_2)^{1/m}$$

where σ_2 and σ_{18} are the mean fracture stress for a 2-inch and 18-inch diameter parts, A_2 is the area of the 2-inch diameter part (3.1416-inch^2), A_{18} is the area of the 18-inch diameter part (254-inch^2), and m = 4, which is the Weibull modulus for chemical vapor deposited silicon carbide; and

18) THAT based on this calculation a skilled artisan would expect that increasing the size of the chemical vapor deposited silicon carbide dome disclosed in Suda et al. to a diameter of 18 inches or greater can result in a dome with propagating cracks and that techniques in addition to the CTE matched substrates would be required to produce a dome to a diameter of 18 inches or greater without propagating cracks.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Jitendra S. Goela

Dr. Jitendra S. Goela

Date: July 14, 2005